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3

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/786,477	SEMENCHENKO, MICHAIL GRIGORIEVICH	
	Examiner	Art Unit	
	Dennis Rosario-Vasquez	2621	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *THREE* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 March 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 March 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

2. The disclosure is objected to because of the following informalities:

Page 14, line 20 is referring to "The dark area 46" and figure 6b;however, numeral 46 is missing within figure 6b.

Appropriate correction is required.

Drawings

3. Figures 1-5 are objected to under 37 CFR 1.84(o) Legends: "Suitable descriptive legends may be used subject to approval by the Office, or may be required by the examiner where necessary for understanding of the drawing. They should contain as few words as possible."

The drawings can be understood after reading the specification; however, a word label or description for the boxes is requested so that a reading of the specification is not necessary for an understanding of the drawings.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3,5-8,10,11,17,19,20-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Matama (U.S. Patent 5,739,922 A).

With regard to claim 1, Matama discloses a method of a system of image processing, comprising the steps of:

a) providing an original image as a matrix of discreet picture elements (pixels) ("CCD array 5 is constituted of...picture elements" of figure 1 @ col. 9,lines 54,55),

b) splitting said original image into n frequency channels (Matama states,"...low frequency components...are extracted (col. 11, lines 41-43).", and "...middle and high frequency components...are extracted...(col. 11, lines 54,55).") , each of said n channels being presented by an image matrix of the same size (Matama discloses that low, middle, and high frequency components are extracted from fine scanning image image signal S subscript F (col. 11, lines 41-56).) as said original image (Using figure 1, Matama states,"...fine scanning operation is carried out by scanning the color image 4 at fine scanning intervals, and...fine scanning image signals S subscript F are... obtained...(col. 11, lines 16-19).") ,

c) detecting edges ("regarded as being the edge portion of the image" @ column 17, lines 5-8.), and

d) assembling an output image (Matama states,"...the processed luminance components Y subscript MH'[MH represent medium and high] are combined with the low frequency components...of the fine scanning image signals S subscript F (R,G,B), and processed image signals R',G', and B' are thereby obtained (col. 17, lines 61-65).") from said n frequency channels taking said detected edges into account (Matama

states," In cases where the correlation value is larger than the predetermined threshold value, the portion associated with the correlation value can be regarded as being the edge portion of the image (col. 17, line 5-8)[Therefore, the correlation values associated with the edge portion are used to determine the gain or weight is multiplied by the luminance.].”),

b1) wherein said splitting said original image is performed into a low frequency channel and n-1 high frequency channels (This element was addressed in part “b)” above),

wherein said detecting edges is performed by:

c1) calculating in each of said n-1 high frequency channels for each pixel (“the picture element” @ column 19, line 16) a correlation value (Matama states," In cases where the correlation value ε among the colors is smaller than a predetermined threshold value…(col. 19, lines 13,14).”) between a processed pixel and its neighboring pixels (Matama states,”…the degree of emphasis of the high frequency component corresponding to the picture element…may be set to be lower than the degree of emphasis of the high frequency components corresponding to the other picture elements (col. 19, lines 13-20).”) followed by

c2) comparing said correlation value with correlation values for the corresponding (by their location in the image) pixels in other said high frequency channels (Matama states,”…when the correlation value between the middle and high frequency components…is calculated, the correlation value is approximately equal to zero with respect to a flat portion…(col. 16, lines 56-60).”) and with a first threshold value for this

channel (Matama states,"...[when] each of the correlation values...is smaller than a predetermined threshold value, the portion associated with the correlation value can be regarded as being the flat portion...(col. 17, lines 1-4).").”; and

c3) forming weighting coefficients (or “gain M”) based on the results of said comparing for each pixel of each of n-1 high frequency channels (Matama states,"...in cases where the correlation value ε is smaller than a predetermined threshold value Th, the value of the gain M is set to be small (col. 17, lines 44-46).", and

d1) said assembling said output image (R',G',B' of figure 9) is made by summing (summation symbol located in the top right corner of figure 9) each pixel from said low frequency channel (Figure 9, label:"RL,GL,BL": “L” represents a low pass signal) with all the corresponding (by their location in the image) pixels of said n-1 high frequency channels multiplied by their weighting coefficients (Matama states," The processed middle frequency components...,which have been multiplied by the gain M, and the processed high frequency components...,which have been multiplied by the gain H...(col. 17, lines 56-59).").

Claim 2 was addressed in c2) above.

With regard to claim 3, Matama discloses the method according to claim 2,

wherein a weighting coefficient (figure 14A: “gain M”) takes a minimal value (The left side of the graph of figure 14A) for correlation values (“ε” axis of figure 14A is an axis of correlations values) that are significantly smaller (“...the correlation value ε is smaller than a predetermined threshold value Th...(col. 17, lines 44,45).”) than said first threshold value (“Th” on the “ε” axis is the threshold value);

said weighting coefficient smoothly increases from its minimal value to its maximal value for correlation values that are close to said first threshold value (The graph of figure 14A increases or ramps up from the left at a minimum "gain M" or weight to a maximum "gain M" or weight towards the right end of the graph and levels off.); and

said weighting coefficient (figure 14A:"gain M") takes its maximal value for correlation values (figure 14A: "ε" axis of correlation values) that are significantly larger ("ε is larger than predetermined threshold value Th...(col. 17, line 47).") than said first threshold value (figure 14A: "Th" value located on the "ε" axis).

With regard to claim 5, Matama discloses a system of a method according to claim 1, wherein M ("middle and high frequency components" @ col. 16, lines 1,2) of said n-1 high frequency channels ("middle and high frequency components" @ col. 16, lines 1,2), where $2 \leq m \leq n-1$, are different from one another "...cross correlations can be classified into three types (col. 16, lines 12,13)." in a direction of their principal passing only (figure 10A has no specific direction, figure 10B has a direction indicated by the diagonal line, figure 10C has a direction indicated by the diagonal line).

With regard to claim 6, Matama discloses a system of a method according to claim 5, wherein said forming weighting coefficients for each pixel of each of said m high frequency channels is made by comparing said corresponding correlation value to said first threshold value and to said correlation values for corresponding (by their location in the image) pixels of other m-1 high frequency channels (The other frequency channels contain middle and high frequency components for each R,G, and B

component color space (col. 16, lines 1-3).).

With regard to claim 7, Matama discloses a system of a method according to claim 1, wherein each of said picture elements (pixels) is represented by a scalar value characterizing ("luminance components" @ col. 17, line 60) , for example, image intensity at said pixel.

With regard to claim 8, Matama discloses a system of a method according to claim 7, wherein said scalar value (Y subscript MH: figure 9, and col. 17, line 60) is calculated for each pixel by multiplication of said pixel value ("...middle and high frequency components...(col. 17, line 50).") by a weighted sum of its neighboring pixels (Matama states,"...the values of the gain M and the gain H are changed in accordance with the correlation value ε, which is the sum of the correlation values...among the colors (col. 19, lines 26-28).").

With regard to claim 11, which is representative of claim 10 and 22, Matama discloses a system of a method according to claim 1, wherein said threshold value (Fig. 14A: "Th") for each of said n-1 high frequency channels is determined by analyzing distribution of pixel values in an image of a corresponding processed frequency channel (Matama states, "...the degree of emphasis [or "Th" of figure 14A] of the high frequency component corresponding to the picture element...may be set [or determined] to be lower than the degree of emphasis of high frequency components corresponding to the other picture elements (col. 19, lines 14-20).").

With regard to claim 17, Matama discloses a system of a method according to claim 1, wherein correlation values (Matama states, "the correlation values εRG, εGB, and εBR among the colors are calculated...(col. 16, lines 31,32).") for several neighboring pixels are smoothed (Matama states,"...the correlation values...are calculated from the...frequency components R subscript MH, G subscript MH, and B subscript MH (col. 16, lines 31-34). The said frequency components are "mean values" (col. 16, line 11).) before (Matama states,"...the gain [or weight] M in accordance with the correlation value at each picture element is calculated from the value of ε having thus been obtained (col. 17, lines 41-43).") said forming said weighting coefficients (Gain "M "is later multiplied by the mean frequency components (col. 17, lines 50,51).), said smoothing being implemented at least in one of n-1 high frequency channels (Matama states,"...correlation values among the middle and high frequency components...are calculated (col. 17, lines 12-14).").

With regard to claim 19, Matama discloses a system of a method according to claim 1, further comprising smoothing said weighting coefficients (This portion of claim 19 was addressed in claim 3 above at "figure 14A increases or ramps up") over neighboring pixels (Matama states,"...m represents the size of the mask for the calculation of the correlation value...(col. 16, lines 47,48) , said smoothing being implemented at least in one of said n-1 high frequency channels (Matama states," ...the correlation values...among the colors are calculated from the middle and high frequency components...(col. 16, lines 31-33).")

With regard to claim 20, Matama discloses a system of a method according to claim 1, wherein said original image is a p-dimensional matrix of said picture elements, where p is greater than or equal to 3 (Matama states,"...CCD array 5 is constituted of 2,760X1840 picture elements (col. 9, line 55).").

With regard to claim 21, Matama discloses a system of a method according to claim 1, wherein different threshold values are used for different parts of said image (Matama states," [When] each of the correlation values...is smaller than a predetermined threshold, the portion associated with the correlation value can be regarded as being the flat portion [or an edge potion for another case] (col. 17, lines 1-8)."), said different threshold values being used to form said weighting coefficients at least in one of said n-1 high frequency charnels.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 12,13,15,16 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matama as applied to claim 1 above, and further in view of Nishimura (U.S. Patent 4,503,461 A).

With regard to claim 12, Matama does teach the use of a pixel of claim 12, but does not teach that a pixel can be represented by a vector.

Matama does teach using luminance values for pixels (col. 17, lines 61-65).

With regard to claim 13, Matama teaches a system of a method according to claim 12, wherein said correlation value for each pixel is calculated as a scalar product of said pixel by a weighted sum representing its neighboring pixels (This element of claim 13 was addressed in claim 8).

However, Matama does not teach the use of a pixel vector and a weighted sum of vectors. Instead Matama is using a weighted sum of scalars.

With regard to claim 15, Matama teaches a method of a system according to claim 12, wherein said threshold value (Fig. 14A: "Th") for each of said n-1 high frequency channels is determined by analyzing distribution of absolute values ("absolute values" @ col. 16, lines 22,28) of pixels of an image of a corresponding processed frequency channel (Matama states, "...the degree of emphasis [or "Th" of figure 14A] of the high frequency component corresponding to the picture element...may be set [or determined] to be lower than the degree of emphasis of high frequency components corresponding to the other picture elements (col. 19, lines 14-20).").

However, Matama does not teach "absolute values of vectors" as required in claim 15. Instead, Matama is using an absolute value of mean values.

With regard to claim 16, Matama teaches all of the elements of claim 16 as addressed in claim 11 above except for "vectors representing pixel values" as required in claim 16.

With regard to claim 23, Matama teaches all of the elements located above at claim 15 except "picture elements [are] represented by a vector".

However, Nishimura does teach, in the field of endeavor of image measuring using weighted sums, claims 12,13,15,16, and 23 of a system of a method according to claims 1 and 21, wherein said picture element (pixel) is represented by a vector (Nishimura states," The magnitude of the [spatial] gradient vector at each point...is compared with thresholds...(col. 5, lines 34-36).".)

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use Matama's luminance or scalar teaching as a gradient within Nishimura's spatial vector gradient teaching because the "use of spatial operators...an improved signal with minimal distortion due to artifact edges is provided (Nishimura, col. 5, lines 47-51)."

8. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matama as applied to claim 1 above, and further in view of Feinberg et al. (U.S. Patent 5,270,654 A)

With regard to claim 24, Matama does teach all the elements except for requiring a complex value.

However, Feinberg et al., in the field of endeavor of MRI imaging, does teach a complex value which represents a picture element (Fienberg states,"...s is the complex value of the i-th pixel of data...(col. 13, line 7).").

With regard to claim 25, Matama teaches all of the elements (claim 8 above) except for requiring "a complex conjugate". Instead Matama uses a scalar value or luminance value.

However, Feinberg et al. does teach using a "pixel by a complex conjugate" (Feinberg states,"...s is a complex value of the l-th pixel of data...and si* is the complex conjugate of s (col. 13, lines 7-9).").

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a complex value which includes the conjugate of Feinberg with Matama's scalar or luminance value because "phase errors can be corrected (col. 13, line 10)." Note that "severe image artifacts may result from the discontinuous pattern of the remaining small phase errors disposed... (col.8, lines 16-19)."; therefore, Feinberg's phase correction ensures "a discontinuous pattern" or "sharp interfaces (col. 19, lines 45,46)" a reduction of the severe artifacts.

9. Claim 9, 14 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Matama and Nishimura and Fienberg as applied to claim 1 above, and further in view of Meno (U.S. Patent 5,003,618).

With regard to claim 9, which is representative of claims 14 and 26, the combination of Matama, Nishimura, and Feinberg teaches all of the elements (claim 5 above) except for the remaining portion about the use of anisotropic weights of claim 9, lines 3-5.

However, Meno teaches, in the field of endeavor of image filtering using anisotropic filter kernels, the remaining potion of claim 9 which anisotropic weights ("weighting calculation" @ col. 4, line 59) are used for calculating said weighted sum of said neighboring pixels (Meno states, "[Gradient] sums are representative of the average value of the pixels in each sector (col. 5, lines 2-6).", a direction of said

anisotropy corresponding to said direction of principal passing for corresponding processed frequency channel (Meno states,"...anisotropic filters...can be oriented with the low pass filter function in the direction of the sector...(col. 5, lines 32-35).").

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Matama's correlation classification (figures 10A-10C and col. 16, line 13: "classified") for detecting edges with Meno's anisotropic filter "in order to enhance line definition (col. 5, line 35)."

10. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matama as applied to claim 1 above, and further in view of Matama.

Matama teaches a system of a method according to claim 2, wherein a weighting coefficient takes a minimal value for correlation values that are significantly smaller than said first threshold value; said weighting coefficient smoothly increases from its minimal value to its maximal value (Addressed in claim 3 above), but does not teach the remaining portion of claim 4.

Matama teaches in another embodiment the remaining portion of claim 4 of "while said correlation value (Figure 8A: HUE ANGLE θ) increases (A first diagonal line increases from "0" to "1.0" of the "WEIGHT FUNCTION W(θ)" axis.) to a second threshold value (The second threshold value is located at on the HUE ANGLE υ axis when said diagonal line reaches "1.0" on said "WEIGHT FUNCTION W(θ)" axis.), said second threshold value being equal to a product of said first threshold value by a pre-defined coefficient (Matama states," Picture elements...which have signal values larger than a predetermined threshold value (col. 14, lines 55,58,59)."; and said

weighting coefficient smoothly decreases (Figure 8A has a second diagonal line that is deacreasing from "1.0" to "0" on the WEIGHT FUNCTION W(θ) axis) from its maximal value (fig. 8A" "1.0") to its limit value (fig. 8A: "0") while said correlation value is larger (Matama states," The signal values corresponding to...a region become markedly larger than those corresponding to the other regions (col. 14, lines 64-66).") than said second threshold value.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Matama's 3rd embodiment (fig. 9:numerals 30,31) of teaching a "degree of emphasis and restriction versus weight or gain" (fig. 14A) with Matama's 2nd embodiment (fig. 4: numeral 23 and figures 8A,8B) of "HUE ANGLE versus WEIGHT FUNCTION or gain" because "processing...is carried out such that the other regions...can be prevented from being extracted and such that the...region can be detected easily (col. 14, line 67 and col.15, lines 1-3)."

Additionally Matama states,"...the roughness in the region...can be restricted. Therefore, a reproduced image having better image quality can be obtained (col. 15, lines 43-46)."

11. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matama as applied to claim 1 above, and further in view of Ito (U.S. Patent 5,907,642).

With regard to claim 18, Matama teaches a transform ("cross correlation" @ col. 16, line 7), but does not teach the remaining elements of claim 18.

However, Ito, in the field of endeavor of image processing of an image in a frequency band, does teach the remaining elements of claim 18 "including non-linear transforming ("muti-resolution transform" @ col. 15, line 41) said correlation values (Ito states,"...x [correlation values] represents the picture element value of each picture element in the detail image bk (col. 15, line48,49)." Note that "bk" was calculated from the multi-resolution transform (col. 15, lines 40,41).) prior to said smoothing said correlation values (Ito states,"...when the values of the coefficient for the emphasis processing are determined, an interpolating operation is carried out...(col. 16, lines 28-30).") , said non-linear transforming remaining unchanged (Ito states,"...for density values $\prec\lambda$, the value of p may reach and remain at 1.0 (col. 15, lines 59,60) [Therefore the value "p" does not change the value of the coefficient "γ" of equation (3) located at col. 15, lines 44-46].") those of said correlation values that are smaller or close to said first threshold value (figure 9 shows "λ" as the first threshold value.), and decreasing those of said correlation values ("γ" of figure 9) (Ito states,"...as the density value [gL of figure 9] of the...image...becomes smaller, the degree of emphasis for the detail image bk may become lower (col. 15, lines 62-64).") that are significantly larger than said first threshold value (Figure 9 shows a region on the GL axis between "λ" and "γ" and "γ" is significantly larger than first threshold value "λ")."

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Matama's graphs (figues 14A and 14B) for determining weights of figures with Ito's graph (figure 9) because "...the... region having a low density can be restricted, and image information representing the...regions having a comparatively

high density can be emphasized to a high extent (Ito, col. 16, lines 20-24)."

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Feldman et al. (U.S. Patent 6,463,167 B1) is pertinent as teaching a method of processing different portions of an image using weights (figure 10).

Gupta et al. (U.S. Patent 5,852,475 A) is pertinent as teaching a method of detecting edges using a directional filter (figures 8A-8D).

Macovski (U.S. Patent 4,463,375 A) is pertinent as teaching a method of separating an image signal into high and low frequencies using weights (fig. 2).

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario-Vasquez whose telephone number is 703-305-5431. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9313.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4750.

DRV
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LEO BOUDREAU